Abstract for NSMMS

LIGHTWEIGHT RADIATOR FOR IN SPACE NUCLEAR ELECTRIC PROPULSION

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Nuclear electric propulsion (NEP) is a promising option for high-speed in-space travel due to the high energy density of nuclear fission power sources and efficient electric thrusters. Advanced power conversion technologies may require high operating temperatures and would benefit from lightweight radiator materials. Radiator performance dictates power output for nuclear electric propulsion systems. Game-changing propulsion systems are often enabled by novel designs using advanced materials. Pitch-based carbon fiber materials have the potential to offer significant improvements in operating temperature, thermal conductivity, and mass. These properties combine to allow advances in operational efficiency and high temperature feasibility.

An effort at the NASA Marshall Space Flight Center to show that woven high thermal conductivity carbon fiber mats can be used to replace standard metal and composite radiator fins to dissipate waste heat from NEP systems is ongoing.
The goals of this effort are to demonstrate a proof of concept, to show that a significant improvement of specific power (power/mass) can be achieved, and to develop a thermal model with predictive capabilities making use of constrained input parameter space. A description of this effort is presented.